

CLAIMS

What I claim as my invention is:

1. An electro-mechanical, microwave load pull tuner comprising an input (test) and an output (idle) port, a horizontal transmission airline in form of a slotted coaxial or parallel plate airline (slabline), a mobile carriage movable parallel to the airline, which holds an adjustable resonant probe to the airline and means for remote control of horizontal and vertical movement of the carriage and of the probe.
2. An electro-mechanical tuner as in claim 1, where the adjustable resonant probe is made of a vertical conductive stab connected to a semi-cylindrical metallic base, capacitively coupled to the central conductor of the airline, the total mounted inside a cylindrical vertical conductive cavity, the vertical stab being movable vertically inside the cavity and the total cavity, assembly, including the vertical stab, being movable horizontally and sliding on top of the slotted airline, all movements being implemented using electrical stepper motors.
3. An electro-mechanical tuner as in claim 1, where the position of the vertical stab inside the cavity of claim 2 can be adjusted in such a way that the variable capacitive coupling, formed between its semi-cylindrical base and the central conductor of the airline, allows controlling the amplitude of the microwave reflection factor created by this coupling.
4. An electro-mechanical tuner as in claim 1, where the horizontal position of the resonant probes of claim 2 can be modified in such a way, that the distance between each resonant probe and the test port of the said tuner can be adjusted and allow controlling the phase of the reflection factor presented at the input port of the tuner.

5. An electro-mechanical tuner as in claim 1, including up to three independently controllable sections, each of which includes one resonant probe and associated electric motion control, each probe being adjusted to resonate at another frequency, said frequencies being typically, but not necessarily, harmonic frequencies multiples of a basic frequency.
6. An electro-mechanical tuner as in claim 1, where remote digital electrical control of the horizontal and vertical position of the resonant probes is implemented using a control computer operating appropriate control software.
7. A calibration method for said electromechanical tuner of claim 1, in which scattering parameters (S-parameters) are measured using a calibrated vector network analyzer (VNA) between the test and idle ports of the tuner at a given frequency of operation and its two harmonics, as a function of the absolute horizontal and vertical position of each resonant probe and saved in a calibration data file for later use.
8. A calibration method for said electromechanical tuner of claim 1, in which S-parameters of said tuner are measured in five steps, step 1 consisting of measuring S-parameters of the tuner as a function of the position of probe 1, probes 2 and 3 being initialized, step 2 consisting of measuring S-parameters of the tuner as a function of the position of probe 2, probes 1 and 3 being initialized, step 3 consisting of measuring S-parameters of the tuner as a function of the position of probe 3, probes 1 and 2 being initialized, step 4 consisting of cascading the S-parameters measured in steps 2 and 3 with the inverse S-parameters of the tuner, measured when all probes are initialized, and step 5 consisting of saving the S-parameters collected and calculated in steps 1 to 4 in a total of 9 calibration data files, one for each of 3 probes and each of 3 harmonic frequencies, ready for retrieval.